

**BLE010V2
(Based on CSR1010)**

Bluetooth Modules

User's Manual

V2.3

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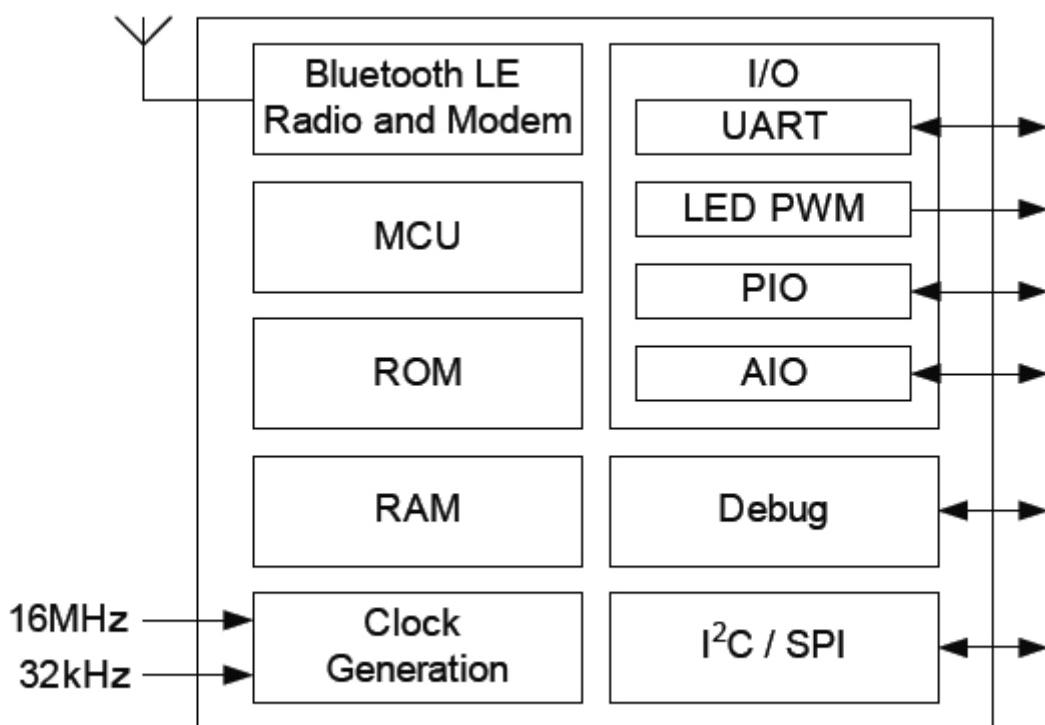
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1 Introduction and Block Diagram

1.1 General Introduction

BLE010V2(CSR1010) is a Bluetooth 4.0 BLE modules which is a high performance, cost effective, low power. The Bluetooth Low Energy module provides a complete 2.4GHz Bluetooth system based on CSR1010 chip which is a single chip data transfer and baseband IC for Bluetooth 2.4GHz systems. This module is fully compliant to Bluetooth v4.0 BLE

1.2 Block Diagram



2 Main Features and Application

2.1 Key Feature

- Fully Qualified Bluetooth v4.1 System.
- 128KB memory, 64K RAM and 64K ROM
- 7.5dBm Bluetooth low energy max TX output power
- -92.5dBm Bluetooth low energy RX sensitivity
- Support for Bluetooth V4.1 specification host stack including ATT,GATT,SMP,L2CAP,GAP
- RSSI monitoring for proximity applications
- <600nA current consumption in dormant mode
- RoHS Compliant

2.2 Application

- Building an ecosystem using Bluetooth low energy
- Human Interface Devices(HID): keyboards, mice,touchpads,romote controls
- Sports and fitness sensors:heart rate, runner speed and cadence, cycle speed and cadence
- Health sensors: blood pressure, thermometer and glucose meters
- Mobile accessories: watches, proximity tags, alert tags and camera controls
- Smart home: heating control and lighting control
- Mesh application for Smart Home

3 Technical Specifications

3.1 General Specification

| Number | Items | Description |
|--------|---------------------------|-------------------------|
| 1 | Bluetooth Standard | Bluetooth v4.1 Standard |
| 2 | Chipset | CSR CSR1010 |
| 3 | Dimension | 19.5mm x 15mm x 2.0mm |
| 4 | Voltage | 1.8V~4.4V |
| 5 | Temperature | -20~+70 °C |
| 6 | Storage Temperature | -40~+85 °C |
| 7 | Frequency Range | 2402~2480MHz |
| 8 | Maximum RF Transmit Power | 7.5dBm |
| 9 | Receive Sensitivity | -92.5dBm |

3.2 Electrical Characteristics

3.21 Absolute Maximum Rating

| Rating | Minimum | Maximum |
|---------------------|---------|---------|
| Storage temperature | -40°C | +85°C |
| Supply Voltage:3V | 1.8V | 4.4V |

3.22 Recommended Operating Conditions

| Operating Condition | Minimum | Maximum |
|-----------------------------|---------|---------|
| Operating temperature range | -20°C | +70°C |
| Supply voltage: VDD_BAT | +1.8V | +4.2V |

3.23 Power Consumption

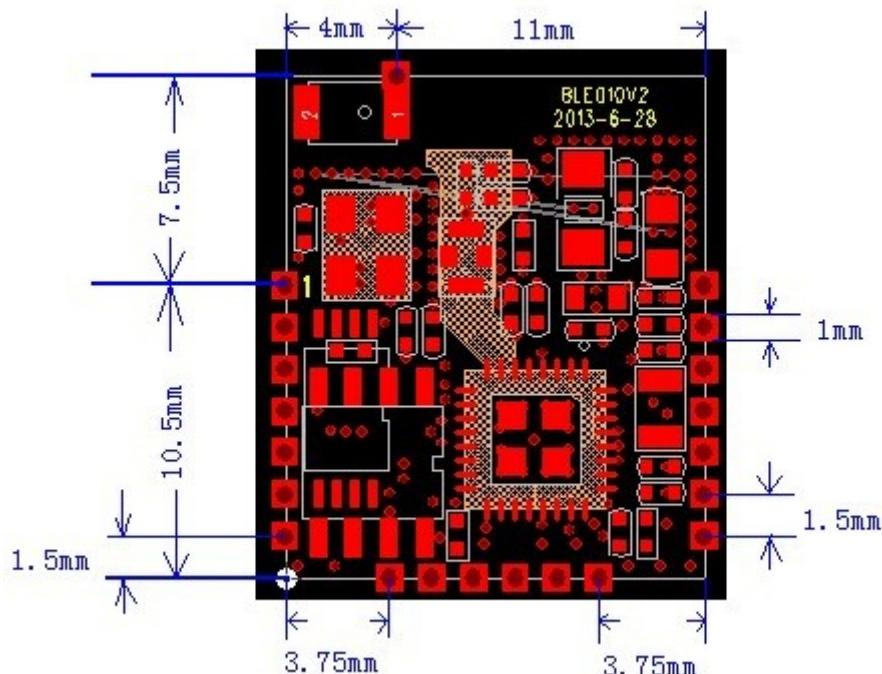
| State | Description | Average Current | Remarks |
|-----------------------------------|---|-----------------|---|
| Fast Advertisements | 1. Switch on the Device 2. Wait for 5 s | 380uA | Advertising Interval: 60 ms ▪ Measurement Time Duration: 20 s |
| Slow Advertisements | 1. Switch on the device 2. Wait for 40 s | 25uA | ▪ Advertising Interval: 1.28 s ▪ Measurement Time Duration: 20 s |
| Connected Idle (Close UART) | 1. Connect to the Host application 2. Wait for 60 s | 14 μ A | ▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s |
| Connected Active (Close UART) | 1. Connect to the Host application 2. Wait for 60 s 3. APP transfer data to BT | 26 μ A | ▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s |
| disconnected | 1. Disconnected the device 2. Wait for 90s | 600nA | |
| Connected Idle (Open UART) | 1. Connect to the Host application 2. Wait for 60 s | 24uA | ▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s |
| Connected active APP→BT→MCU | 1. Connect to the Host application 2. Wait for 60 s 3: APP transfer data to MCU | 30uA | ▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s |
| Connected active MCU→BT→APP | 1. Connect to the Host application 2. Wait for 60 s 3: MCU transfer data to APP | 700~900uA | ▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s |
| Connected active Two-way transfer | 1. Connect to the Host application 2. Wait for 60 s 3: APP and MCU transfer data at the same time | 1mA | ▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s |

3.24 Connected distance

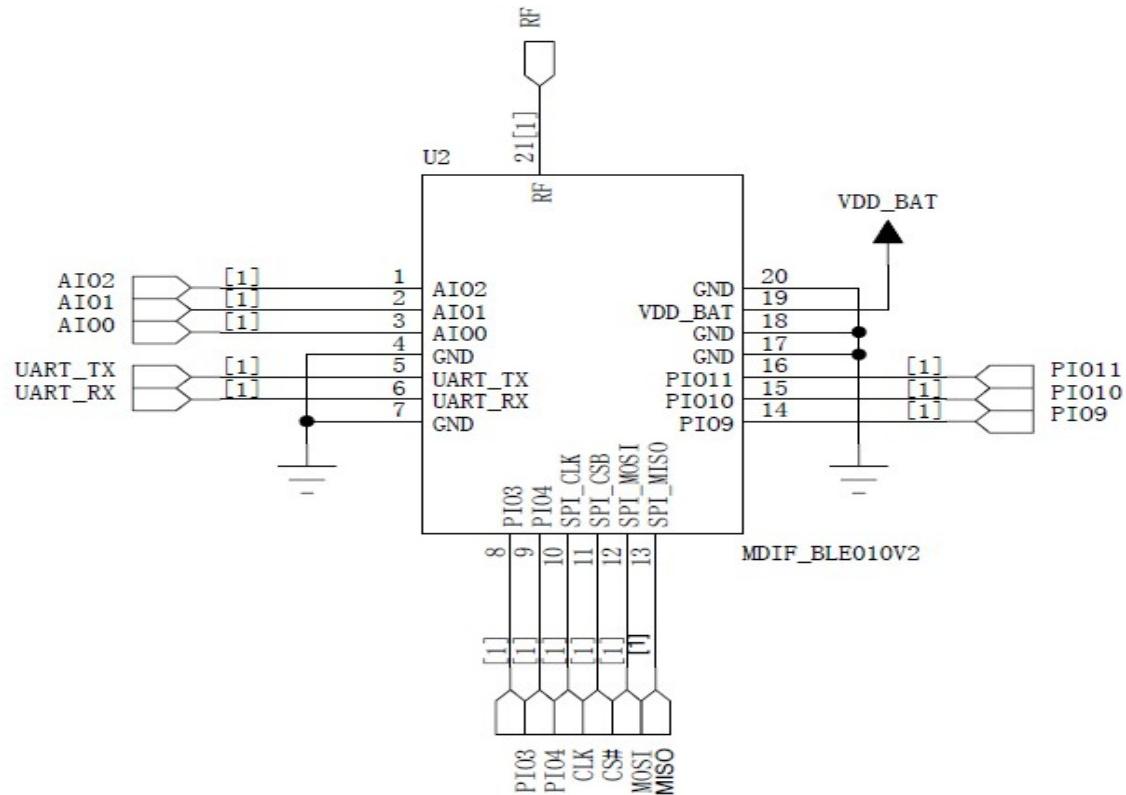
| State | Distance | Connected time | Remarks |
|---------------------|-------------|----------------|---------|
| Fast Advertisements | <20meters | 1S | |
| | >20meters | 1~2S | |
| Slow Advertisements | <20meters | 1~2S | |
| | >20meters | 2~6S | |
| Connected state | <= 50meters | | |

4 Mechanical Dimensions and Electrical feature

4.1 BLE010V2(CSR1010) module outline:(mm)



4.2 Package dimensions

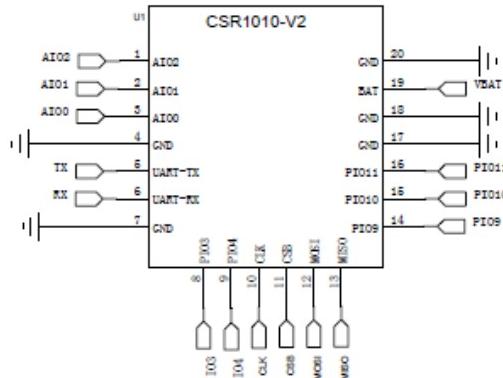


4.3 Pin Assignment

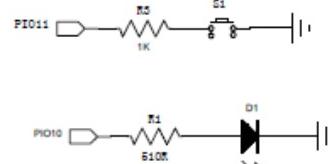
| Pin No. | Name | Functions | Description |
|---------|----------|---|---|
| 1 | AI00 | | |
| 2 | AI01 | Bidirectional analogue | Analogue programmable I/O line. |
| 3 | AI02 | | |
| 4 | GND | VSS | Ground |
| 5 | UART_TX | Bidirectional with programmable strength internal pullup/down | UART TX |
| 6 | UART_RX | | UART RX |
| 7 | GND | VSS | Ground |
| 8 | PIO3 | Bidirectional | Programmable input / output line |
| 9 | PIO4 | Bidirectional | Programmable input / output line |
| 10 | SPI_CLK | Bidirectional with programmable strength internal pullup/down | debug SPI CLK selected by SPI_PIO#. t |
| 11 | SPI_CS | | debug SPI chip select (CS#) selected by SPI_PIO#. |
| 12 | SPI_MOSI | | debug SPI MOSI selected by SPI_PIO#. |
| 13 | SPI_MISO | | debug SPI MISO selected by SPI_PIO#. |
| 14 | PIO9 | Bidirectional | Programmable input / output line |
| 15 | PIO10 | Bidirectional | Programmable input / output line |
| 16 | PIO11 | Bidirectional | Programmable input / output line |
| 17 | GND | VSS | Ground |
| 18 | GND | VSS | Ground |
| 19 | VDD_BAT | Power supply | Battery input and regulator enable (active high). |
| 20 | GND | VSS | Ground |

5 Reference Design

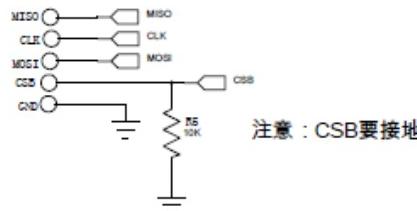
蓝牙模块脚位图



按键和LED



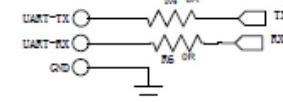
SPI接口



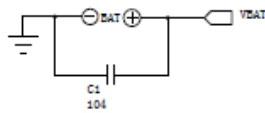
REVISION RECORD

| LTR | ECO NO: | APPROVE |
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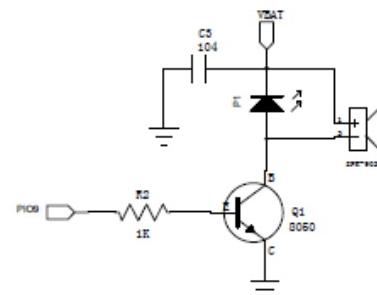
UART接口



电源，工作电压1.8-3.6V



蜂鸣器驱动电路



引脚介绍：

AIO:3个模拟信号输入输出口

- 测量温度、湿度、流量、速度、液位、压力等多种模拟量，用来接外部传感器。

GPIO: 共有5个GPIO，用来控制LED，蜂鸣器

UART:数据透传的核心

- 主要和客户讨论波特率和传输数据字节 (10Byte)

VBAT:供电范围 1.8-3.6V

6 NOTICE-----MOST IMPORTANCE!

This chapter contains important information for the safe and reliable use of the BLE010V2 module. Please read this chapter carefully before starting to use the BLE010V2 Module.

6.1 General information

Bluetooth technology, is in fact a kind of short distance wireless communication technology, can effectively simplify the palmtop computer, notebook computer and mobile phone, Mobile Phone and other mobile communication between communication terminal equipment, but also can successfully simplify the equipment and communication between the Internet, so that these modern communications equipment and Internet data transmission between rapidly became more efficient, to widen the road for wireless communication.

6.2 Electrostatic Discharge (ESD)

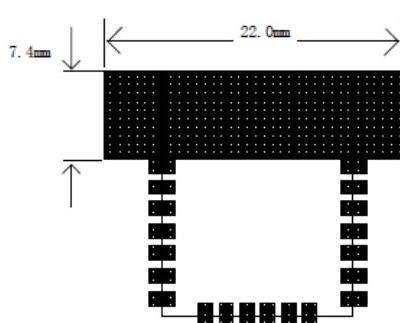
The following Electrostatic Discharge (ESD) precautions are recommended:

- Protective outer garments.
- Handle device in ESD safeguarded work area.
- Transport device in ESD shielded containers.
- Monitor and test all ESD protection equipment.

6.3 Antenna Design

注意：

如图中标注所示的位置区域为此模块天线需避空的区域，
不能有影响天线信号的东西，如：电池，屏蔽罩等金属。



还有就是在贴模块的主PCB上此区域不能覆铜，尤其是模块的左边区域要尽可能的避空，因为天线接收和发射信号端的方向是靠左的。
设计时最好将模块的天线部分靠近主PCB板的边缘处，
这样就可以尽可能的减小对天线信号的影响以免致产品距离太近。

7 AT Command Set

If BLE010V2 module has the AT command settings:

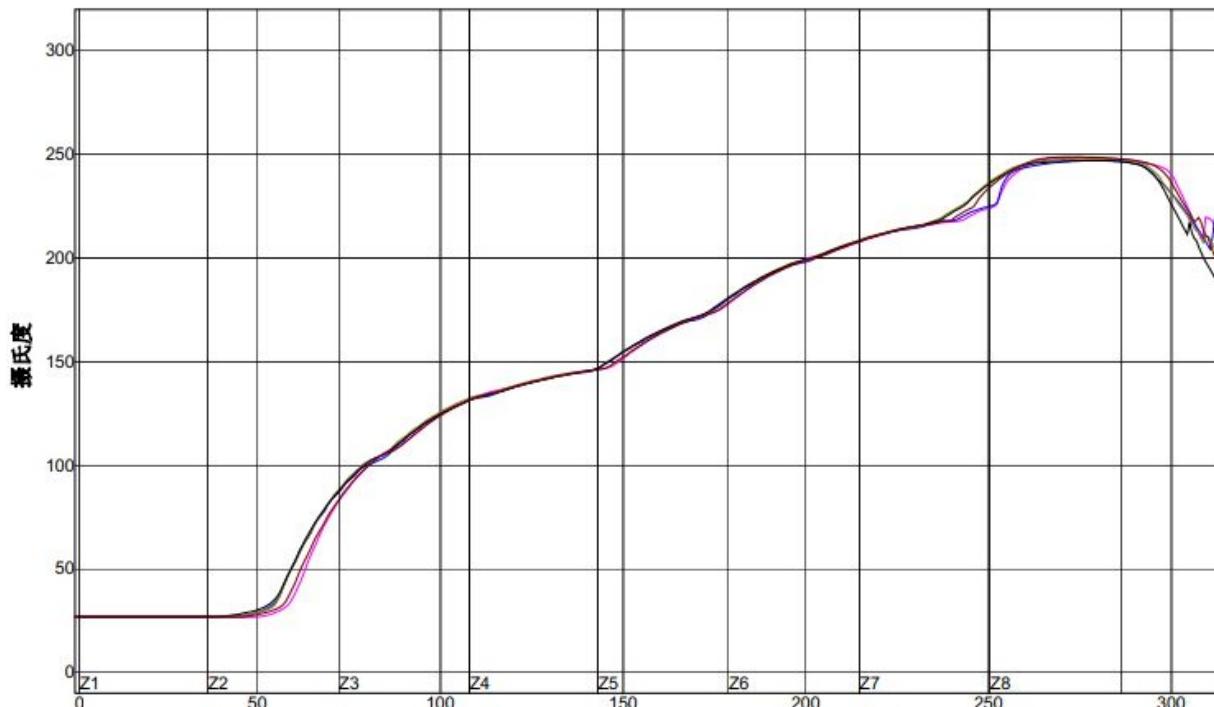
| BLE010 AT Command | | | | |
|---|-----------------------|--|---|--|
| Command Format | Power Down Protection | Specification | Returned Value | Descriptions |
| ASCII: ^AT-Nxxxxx^ Hex: 5E 41 54 2D 4E ***5E | YES | xxxxx is the Bluetooth name of the device ^ is the end mark | Applied successfully: OK Applied failed: ERP | |
| ASCII: ^AT-MAC Hex: 5E 41 54 2D 4D 41 43 | NO | Read the MAC Address of the device | Applied successfully: MAC Data Applied failed: ERP | If setting successfully then return the MAC like: 20 2A 32 34 32 34 |
| ASCII: ^AT-STATER Hex: 5E 41 54 2D 53 54 41 54 45 52 | NO | Read the state of the device | Applied successfully: STATER Applied failed: ERP | STATER1: Fast broadcast STATER2: Slow broadcast STATER3: Linked STATER5: un-linked and ready to answer the link request |
| ASCII: ^AT-STATEW01 Hex: 5E 41 54 2D 53 54 41 54 45 57 30 31 | NO | Set the state of the device | Applied successfully: OK Applied failed: ERP | 01 to broadcast state: Make the device go into the broadcast state without matter the current work state |
| ASCII: ^AT-RATEXXXXXX Hex: 5E 41 54 2D 52 41 54 45 ***** | YES | Set the UART speed | Applied successfully: UART speed Applied failed: ERP | AT-RATE002400: 2400 AT-RATE115200: 115200 Support speed: 2400, 9600, 19200 38400 115200 230400 |

Remark:

1. AT Command will be available when the UART open.
2. ^AT-Nxxxxx^ and ^AT-STATEW01 will reset Bluetooth device and make Bluetooth on the broadcast state.
3. Please use ASCII or hexadecimal number format send AT commands

8 Recommended Reflow Temperature Profile

The module must go through 125C baking for at least 9 hours before SMT AND IRreflow process.



| PWI= 82% | 最高上升斜率 | 最高下降斜率 | 恒温时间150至217C | 回流时间 /217C | 最高温度 | 总共时间 /217C | | | | | | |
|----------|--------|--------|--------------|------------|-------|------------|-------|-----|--------|-----|-------|-----|
| 2 | 2.58 | 72% | -1.36 | 82% | 87.43 | -9% | 72.59 | 42% | 248.61 | 72% | 72.59 | 42% |
| 3 | 2.38 | 58% | -1.45 | 77% | 89.27 | -2% | 73.13 | 44% | 247.17 | 43% | 73.13 | 44% |
| 4 | 2.45 | 63% | -1.76 | 62% | 87.96 | -7% | 71.91 | 40% | 248.17 | 63% | 71.91 | 40% |
| 5 | 2.39 | 59% | -2.09 | 45% | 87.88 | -7% | 68.87 | 30% | 247.17 | 43% | 68.87 | 30% |
| 6 | 2.50 | 67% | -1.85 | 57% | 87.88 | -7% | 72.15 | 41% | 248.90 | 78% | 72.15 | 41% |
| 温差 | 0.20 | | 0.73 | | 1.84 | | 4.26 | | 1.73 | | 4.26 | |

9 Related recommended

- Full metal shell will greatly shorten the Bluetooth transmission distance
- Bluetooth antenna below PCB plate not coppe

10 Document History

| Revision | Date | History |
|----------|------------|--------------------------|
| V1.0 | 2013-3-20 | First release |
| V2.0 | 2013-6-30 | Re-Design ANT |
| V2.1 | 2013-11-25 | Re-Set the PINs Design |
| V2.2 | 2014-6-30 | Add AT command |
| V2.3 | 2015-2-10 | Renew the AT command set |
| | | |